

General Certificate in Secondary Education

UNIT A564

Design and Technology

Innovator Suite

Resistant Materials

Unit A564: Technical aspects of designing and making

Specimen Paper

Time: 1 hour 15 minutes

Additional Materials:



INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- You have 2 minutes to read through this question paper.
- Answer **all** the questions.
- You may answer the parts of each question in any order you wish, **writing legibly** with a pencil or pen
- Do not write in the bar codes.
- Do not write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.

FOR EXAMINER'S USE

1	
2	
3	
4	
5	
TOTAL	

This document consists of **13** printed pages and **3** blank pages.

Section A

Answer **all** questions.

- 1 Fig. 1 shows views of a self-assembly table made from manufactured board.

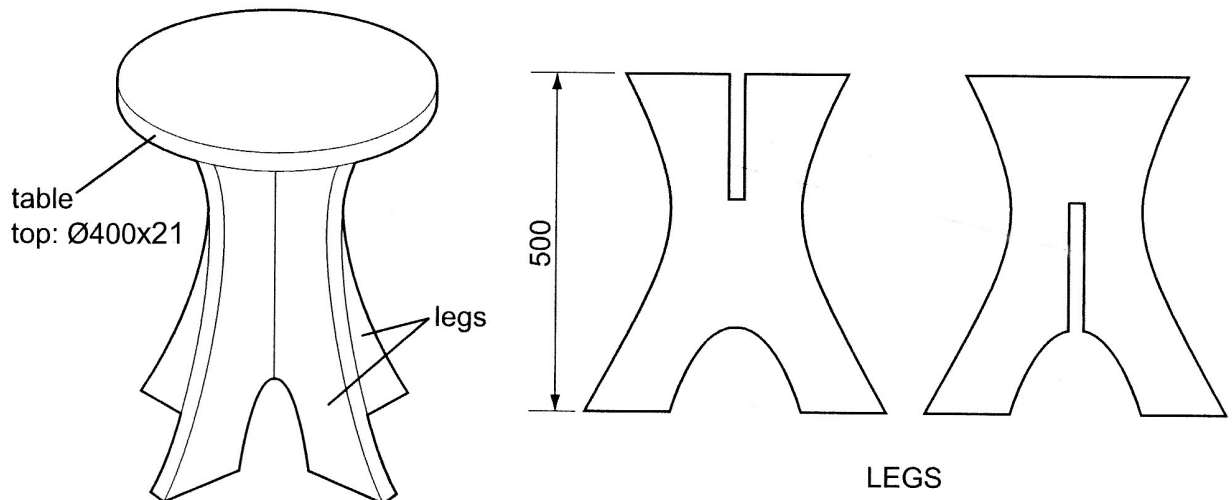


Fig.1

- (a) (i) Name a suitable manufactured board for the table.

..... [1]

- (ii) Give **two** advantages of using a manufactured board rather than solid wood for the table.

1 [1]

2 [1]

- (b) The legs are to be attached to the top by means of knock-down (K-D) fittings.

Use sketches and notes to show how **one** K-D fitting could be used to attach a leg to the top.

Name the K-D fitting.

[2]

[1]

(c) The self-assembly table will be sold without a finish.

(i) Give **two** reasons why the manufacturer has not applied a finish to the table.

1 [1]

2 [1]

(ii) Give **one** reason why it would be an advantage to apply a finish to the table before it is assembled.

..... [1]

(d) The circular table top would be cut from a square piece of manufactured board.

(i) Name **one** portable power tool that could be used to cut out the shape.

..... [1]

(ii) Give **two** safety precautions you would need to take when cutting out the shape using the portable power tool.

1 [1]

2 [1]

[Total: 12]

2 Fig.2 shows views of a free-standing clock.

The clock is made from two separate pieces of acrylic.

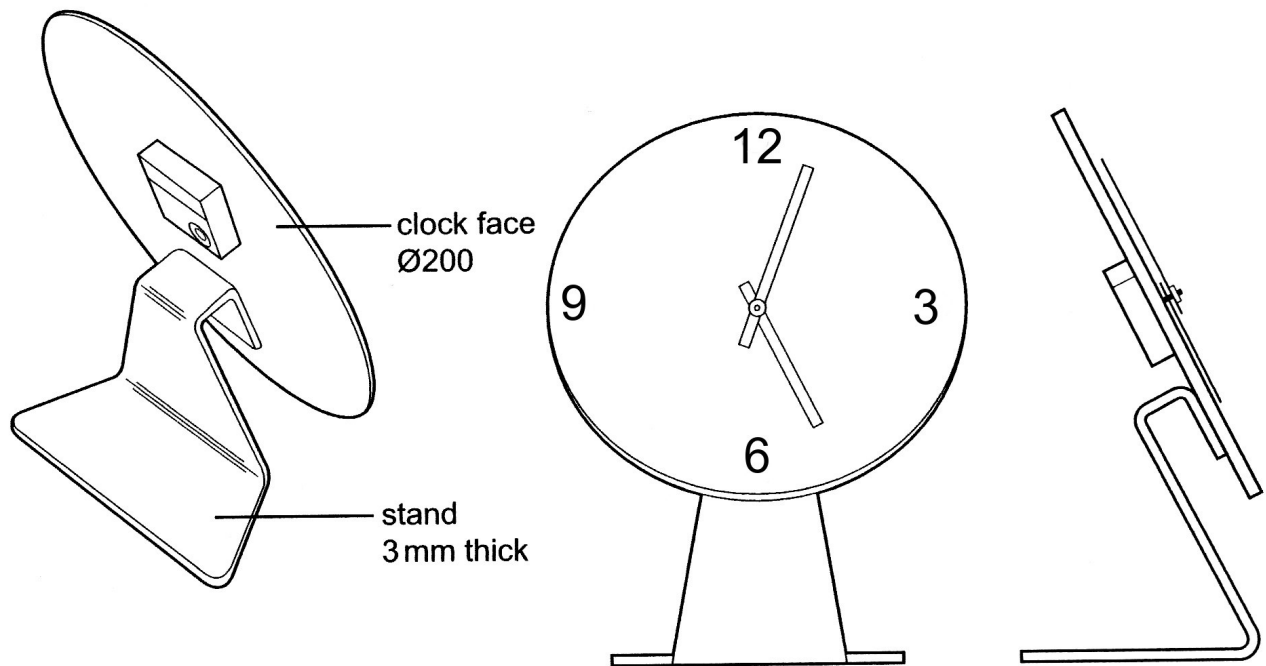


Fig.2

(a) The table below shows some of the tools and items of equipment used to make the clock.

Complete the table by stating the purpose of each tool or item of equipment used when making the clock.

Tool / item of equipment	Purpose	
Marker pen		[1]
Coping saw		[1]
Line bender / strip heater		[1]
Wet and dry paper		[1]
Tensol cement		[1]

(b) State **two** properties of acrylic that makes it suitable for this clock.

1..... [1]

2..... [1]

(c) Give **two** reasons why a designer would construct a prototype model of the clock before making it from acrylic.

1..... [1]

2..... [1]

(d) The numbers on the clock will be produced using CAM.

Give **three** stages in producing the numbers using CAM.

1..... [1]

2..... [1]

3..... [1]

[Total: 12]

3 Fig.3 shows a wall-mounted shelf unit.

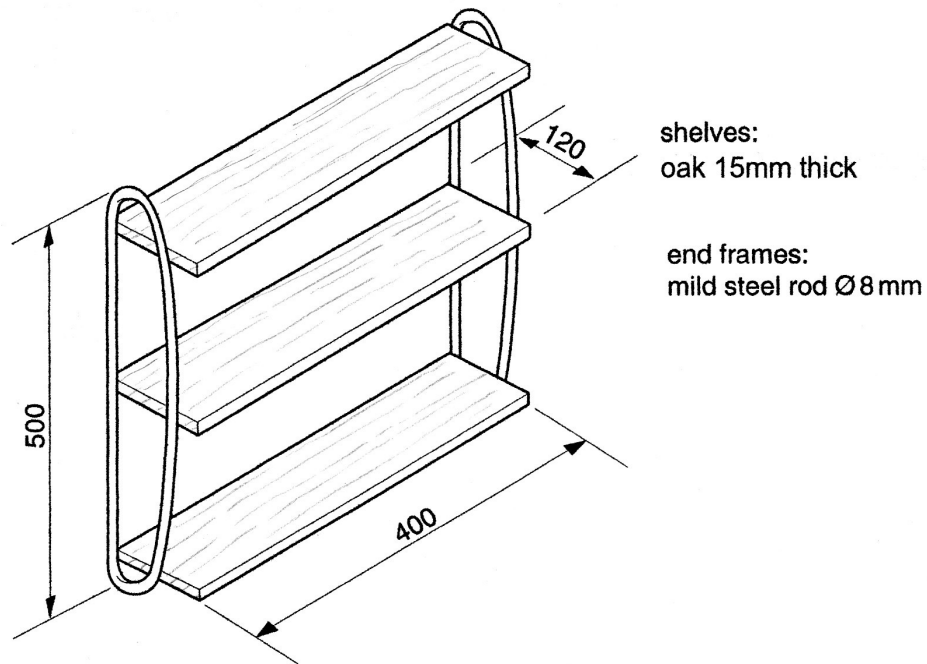


Fig.3

- (a) The end frames of the shelf unit are made from 8mm diameter mild steel rod.
The mild steel rod would need to be annealed before bending it to shape.

(i) State what annealing does to the mild steel.

..... [1]

(ii) Describe how the mild steel rod would be annealed.

..... [2]

- (b) Fig. 4 shows a wooden former around which a length of annealed mild steel rod could be bent to the shape of the end frame. The former is fixed to a baseboard.

Add sketches and notes to Fig. 4 to show how the annealed mild steel could be held in place while it is bent to shape around the former.

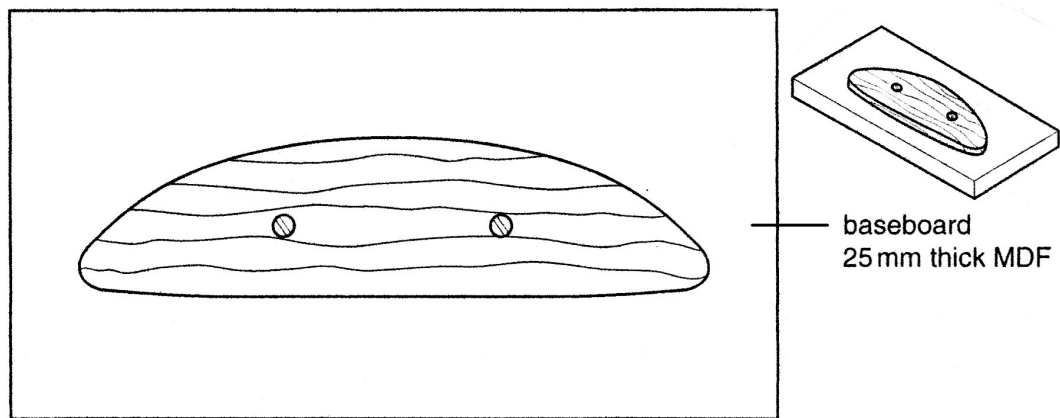


Fig.4

[3]

- (c) Use sketches and notes to show how the mild steel end frames could be fixed to the shelves. Your solution must be capable of being taken apart.

Modifications may be made to the end frames and / or the shelves.

[3]

(d) The oak shelves will be finished with polyurethane varnish.

Complete the table below by describing **three** processes that would need to be carried out before applying a final coat of polyurethane varnish to the shelves.

Stage	Process	
1		[1]
2		[1]
3		[1]
4	Apply final coat of polyurethane varnish	

[Total: 12]

Section B

Answer **all** questions

- 4 Fig. 5 shows a wall-mounted DVD rack. The DVD rack is produced by injection moulding.

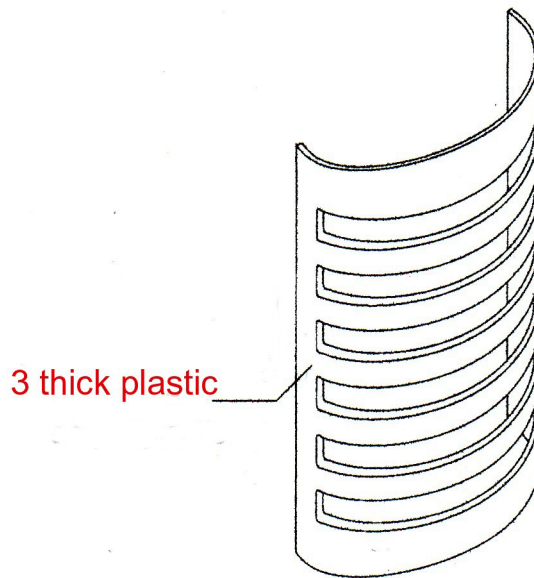


Fig.5

- (a) Explain why injection moulding is only cost effective when products are manufactured in large quantities.

.....

.....

..... [2]

- (b) Describe two quality control checks that could be carried out during the manufacture of the DVD rack.

1..... [1]

2..... [1]

(c) The DVD rack could also be made from sheet plastic rather than by injection moulding.

(i) Describe how the curved shape of the DVD rack could be formed.

.....

 [2]

(ii) Explain why injection moulding is a more environmentally-friendly process than making the DVD rack from sheet plastic.

.....

 [2]

(d) The DVD rack is to be wall-mounted.

Use sketches and notes to show a modification to the DVD rack shown in Fig. 5 so that it could be wall-mounted.

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[2]

(e) The DVD rack could be termed a 'fashionable' product.

Give two reasons why fashionable products, over time, can have a harmful effect on resources.

1 [1]

2 [1]

[Total: 12]

5 Fig. 6 shows a washing machine.

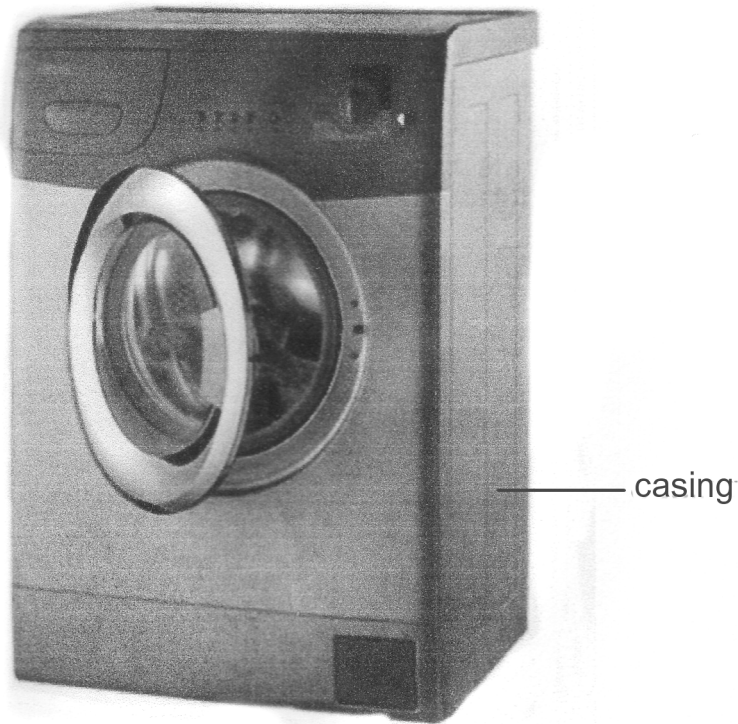


Fig.6

(a) The washing machine casing is made from mild steel sheet.

Give **two** reasons why mild steel sheet is a suitable material for the casing.

1..... [1]

2..... [1]

(b) Many products are designed for disassembly.

Explain what this means with reference to the washing machine.

.....

 [2]

- (c) Many appliances such as washing machines, fridges and freezers can be moved around by lifting the appliance onto the 'rollers' shown below.

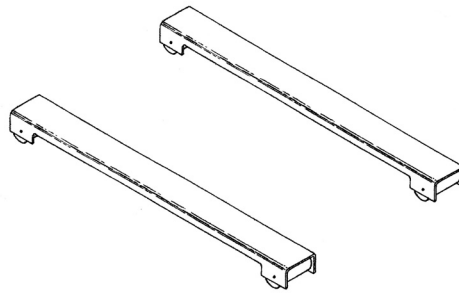


Fig. 7 shows details of one roller.

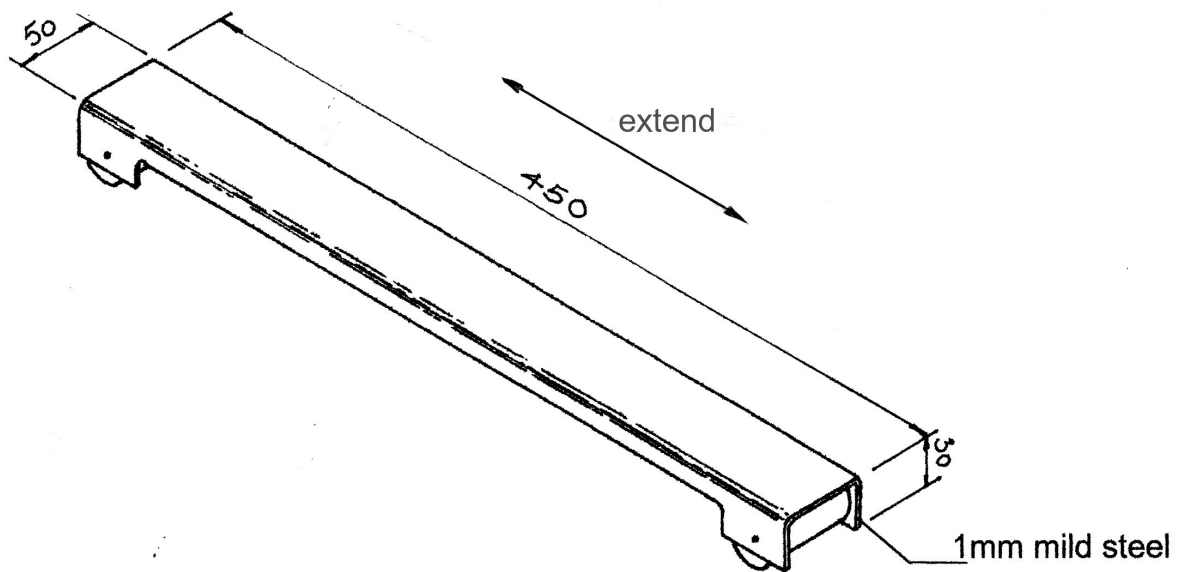


Fig. 7

- (i) Use sketches and notes to show how the design of the roller could be modified to extend in the direction shown so that it could be used with different size appliances. Give details showing how the roller could be locked in position when extended.

- (ii) Use sketches and notes to show a modification to the roller so that an appliance could not slide off the ends of the roller.

[2]

- (d) The washing machine shown in Fig. 6 is an example of a product that has been designed and manufactured with 'built-in obsolescence'.

Explain, with reference to the washing machine, what is meant by 'built-in obsolescence'.

.....
.....
..... [2]

[Total: 12]

[Paper Total: 60 marks]

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The maximum mark for this paper is [60].

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Section A		
Question Number	Answer	Max Mark
1(a)(i)	<p>Name a suitable manufactured board for the table.</p> <p>Suitable manufactured board: plywood, MDF. Not blockboard, chipboard, laminboard.</p>	[1]
1(a)(ii)	<p>Give <u>two</u> advantages of using a manufactured board rather than solid wood for the table.</p> <p>2 advantages: stable, available in wide boards, cheaper, more environmentally friendly. Not easier to work.</p>	[1] [1]
1(b)	<p>The legs are to be attached to the top by means of knock-down (K-D) fittings. Use sketches and notes to show how one K-D fitting could be used to attach a leg to the top. Name the K-D fitting.</p> <p>Clear sketch of K-D fitting in correct position. Correct name of K-D fitting.</p>	[2] [1]
1(c)(i)	<p>The self-assembly table will be sold without a finish. Give <u>two</u> reasons why the manufacturer has not applied a finish to the table.</p> <p>2 reasons for manufacturers not applying finish: reduces cost to consumer, quicker production, customer preferences.</p>	[1] [1]
1(c)(ii)	<p>Give <u>one</u> reason why it would be an advantage to apply a finish to the table before it is assembled.</p> <p>Advantage for applying finish before assembly: better finish, quicker, less awkward.</p>	[1]
1(d)(i)	<p>The circular table top would be cut from a square piece of manufactured board. Name <u>one</u> portable power tool that could be used to cut out the shape.</p> <p>Portable power tool: jig saw, router.</p>	[1]
1(d)(ii)	<p>Give <u>two</u> safety precautions you would need to take when cutting out the shape using the portable power tool.</p> <p>2 safety precautions: correct blade, workpiece held securely, no trailing leads, clearance under workpiece.</p>	[1] [1]

Section A																				
Question Number	Answer	Max Mark																		
2(a)	<p>The table below shows some of the tools and items of equipment used to make the clock.</p> <p>Complete the table by stating the purpose of each tool or item of equipment used when making the clock.</p> <table border="1"> <thead> <tr> <th>Tool / item of equipment</th><th>Purpose</th><th></th></tr> </thead> <tbody> <tr> <td>Marker pen</td><td>To mark out the bend lines/shape of the clock</td><td>[1]</td></tr> <tr> <td>Coping saw</td><td>To cut the shape of the clock</td><td>[1]</td></tr> <tr> <td>Line bender / strip heater</td><td>To heat the acrylic to make it soft so that it can be bent to shape</td><td>[1]</td></tr> <tr> <td>Wet and dry paper</td><td>To finish/polish/smooth the edges of the acrylic</td><td>[1]</td></tr> <tr> <td>Tensol cement</td><td>To stick the clock face to the stand</td><td>[1]</td></tr> </tbody> </table>	Tool / item of equipment	Purpose		Marker pen	To mark out the bend lines/shape of the clock	[1]	Coping saw	To cut the shape of the clock	[1]	Line bender / strip heater	To heat the acrylic to make it soft so that it can be bent to shape	[1]	Wet and dry paper	To finish/polish/smooth the edges of the acrylic	[1]	Tensol cement	To stick the clock face to the stand	[1]	
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Tensol cement	To stick the clock face to the stand	[1]																		
2(b)	<p>State <u>two</u> properties of acrylic that makes it suitable for this clock.</p> <p>2 properties of acrylic: easily machined, bent to shape, good impact resistance, inherent colour.</p>	[1] [1]																		
2(c)	<p>Give <u>two</u> reasons why a designer would construct a prototype model of the clock before making it from acrylic.</p> <p>2 reasons for prototype model: check size and shape, balance, position of bends, show potential customers.</p>	[1] [1]																		
2(d)	<p>The numbers on the clock will be produced using CAM.</p> <p>Give <u>three</u> stages in producing the numbers using CAM.</p> <p>3 stages using CAM for the numbers: can be engraved or applied.[1] Engraved using CAMM 2, laser cutter or equivalent: set up workpiece, set tool parameters, start machine.</p> <p>OR</p> <p>Applied using CAMM1 vinyl cutter or equivalent: set up vinyl in machine, transfer data from computer to machine, start cut, peel off, apply tape, apply to clock face.</p>	[3]																		
3(a)(i)	<p>The end frames of the shelf unit are made from 8mm diameter mild steel rod. The mild steel rod would need to be annealed before bending it to shape. State what annealing does to the mild steel.</p> <p>Annealing softens the metal, makes it malleable, makes it easier to bend.</p>	[1]																		
3(a)(ii)	<p>Describe how the mild steel rod would be annealed.</p> <p>Mild steel would be heated up to cherry red. [1] The metal would be allowed to cool. [1]</p>	[2]																		

Section A		
Question Number	Answer	Max Mark
3(b)	<p>Fig. 4 shows a wooden former around which a length of annealed mild steel rod could be bent to the shape of the end frame. The former is fixed to a baseboard.</p> <p>Add sketches and notes to Fig. 4 to show how the annealed mild steel could be held in place while it is bent to shape around the former.</p> <p>Use of blocks and pegs to position the mild steel rod against the former. [0-2] Retention of end of rod.[1]</p>	[3]
3(c)	<p>Use sketches and notes to show how the mild steel end frames could be fixed to the shelves. Your solution must be capable of being taken apart. Modifications may be made to the end frames and / or the shelves.</p> <p>Modifications to the mild steel ends including the use of brackets, modifications to the length/width of shelf. [1] Fixing to the shelf. Use of screws, nuts and bolts. [1] Fixing to the frame. Use of screws, nuts and bolts. [1]</p>	[3]
3(d)	<p>The oak shelves will be finished with polyurethane varnish. Complete the table below by describing three processes that would need to be carried out before applying a final coat of polyurethane varnish to the shelves.</p> <p>3 processes carried out before applying varnish: plane surface with smoothing plane, cabinet scraper, medium grade glasspaper, fine grade glasspaper, remove surface dust.</p>	[3]
Section A Total		[36]

Section B		
Question Number	Answer	Max Mark
4(a)	<p>Explain why injection moulding is only cost effective when products are manufactured in large quantities.</p> <p>Injection moulding only cost effective for large quantities: cost of tool [mould] is expensive. [1] Therefore large quantities need to be produced to recover costs. [1]</p>	[2]
4(b)	<p>Describe <u>two</u> quality control checks that could be carried out during the manufacture of the DVD rack.</p> <p>2 quality control checks: size [check tolerances], visual appearance, DVD fit.</p>	[2]
4(c)	<p>The DVD rack could also be made from sheet plastic rather than by injection moulding.</p> <p>(i) Describe how the curved shape of the DVD rack could be formed.</p> <p>Heated in an oven [1]. Shaped around a former [1].</p> <p>(ii) Explain why injection moulding is a more environmentally-friendly process than making the DVD rack from sheet plastic.</p> <p>Injection moulding uses precise amounts of plastic granules. [1] Using sheet plastic results in left over pieces wasted. [1]</p>	[2]
4(d)	<p>The DVD rack is to be wall-mounted.</p> <p>Use sketches and notes to show a modification to the DVD rack shown in Fig. 5 so that it could be wall-mounted.</p> <p>Practical method includes use of 'lugs' or flange. 0-2 dependent upon technical accuracy of modification.</p>	[2]
4(e)	<p>The DVD rack could be termed to be a 'fashionable' product.</p> <p>Give <u>two</u> reasons why fashionable products, over time, can have a harmful effect on resources.</p> <p>Fashionable products can have a relatively short lifespan before going out of fashion. New products will be made to replace less fashionable products, therefore using more resources.</p>	[1] [1]

Section B		
Question Number	Answer	Max Mark
5(a)	<p>The washing machine casing is made from mild steel sheet.</p> <p>Give <u>two</u> reasons why mild steel sheet is a suitable material for the casing.</p> <p>2 reasons include: relatively cheap material, hardwearing / durable, can be shaped easily, takes different finishes.</p>	<p>[1]</p> <p>[1]</p>
5(b)	<p>Many products are designed for disassembly.</p> <p>Explain what this means with reference to the washing machine.</p> <p>Disassembly: there are parts in the washing machine that can be recovered and used again as opposed to being recycled. [1]</p> <p>The design of the washing machine is such that the parts can be recovered relatively quickly. [1]</p>	[2]
5(c)	<p>Many appliances such as washing machines, fridges and freezers can be moved around by lifting the appliance onto the 'rollers'.</p>	
5(c)(i)	<p>Use sketches and notes to show how the design of the roller could be modified to extend in the direction shown so that it could be used with different size appliances. Give details showing how the roller could be locked in position when extended.</p> <p>Extend using two different size channels inside / outside each other. [0-2]</p> <p>Method of locking: use of screws, nuts and bolts. [0-2]</p>	[4]
5(c)(ii)	<p>Use sketches and notes to show a modification to the roller so that an appliance could not slide off the ends of the roller.</p> <p>Retention by means of raised edge / lip to roller. Use of grip pads.</p>	[2]
5(d)	<p>The washing machine shown in Fig. 6 is an example of a product that has been designed and manufactured with 'built-in obsolescence'.</p> <p>Explain, with reference to the washing machine, what is meant by 'built-in obsolescence'.</p> <p>Planned obsolescence is the decision by the manufacturer to produce a product that will become obsolete or cease to function in a defined time. The washing machine has parts that are made to last a specific length of time or number of operations.</p>	[2]
Section B Total		[24]
Paper Total		[60]

Assessment Objectives Grid (includes QWC)

Question	AO1	AO2	AO3	Total
1(a)(i)	1			1
1(a)(ii)	2			2
1(b)	3			3
1(c)(i)	2			2
1(c)(ii)	1			1
1(d)(i)	1			1
1(d)(ii)	2			2
2(a)	5			5
2(b)	2			2
2(c)	2			2
2(d)	3			3
3(a)(i)	1			1
3(a)(ii)	2			2
3(b)	3			3
3(c)	3			3
3(d)	3			3
4(a)	2			2
4(b)			2	2
4(c)(i)	2			2
4(c)(ii)			2	2
4(d)	2			2
4(e)	2			2
5(a)	1		1	2
5(b)			2	2
5(c)(i)	4			4
5(c)(ii)			2	2
5(d)	2			2
Totals	51		9	60